UK Road Accident Data Analysis Report Technical Analysis of Road Accident Trends (2005–2016)

Introduction

This report presents a technical analysis of UK road accident data (STATS19) from 2005 to 2016 using Power BI. The objective is to identify long-term trends, severity patterns, geographic concentration, environmental and temporal influences, and demographic/vehicle-related risk factors to support evidence-based road safety strategies.

Dataset Overview

The dataset contains 1,190,549 recorded road traffic accidents with the following key fields:

- Accident year and date/time
- Geographic location (Local Authority, Latitude, Longitude)
- Accident severity (Slight, Serious, Fatal)
- Weather conditions, light conditions, and road surface conditions
- Speed limit
- Vehicle type
- Driver age band and sex

Key measures created include:

- Total Accidents
- Total Casualties
- Fatal Accidents and Fatal Percentage
- Severity Distribution %
- Average Casualties per Accident
- Average Vehicles per Accident

All severity-based visualisations use 100% stacked distributions for proportional comparison.

Long-Term Accident & Fatality Trends

Total accidents declined by 38% from approximately 124,000 in 2005 to 77,000 in 2016, demonstrating significant improvement in overall road safety volume.

However, the fatal severity rate remained relatively stable, fluctuating between 0.7% and 1.1%. This indicates diminishing returns from existing safety interventions, while exposure has reduced, high-severity risk factors persist.

Geographic Concentration

Accidents are heavily concentrated in major urban corridors, particularly:

- Greater London
- Birmingham metropolitan area
- Manchester and surrounding regions

This distribution strongly correlates with population density, traffic volume, and major commuter routes, highlighting these areas as priorities for targeted enforcement and infrastructure improvements.

Temporal & Environmental Analysis - **Hourly & Daily Patterns**
Accident frequency peaks during morning (7–9am) and evening (3–6pm) rush hours, with increased late-night activity at weekends. This suggests commuter traffic volume is a stronger driver of accident frequency than environmental severity.

Speed Limit & Severity Higher speed limits show a clear increase in serious and fatal proportions. 60-70 mph roads have significantly higher severe outcomes than 30 mph roads, confirming the exponential relationship between speed and injury severity.

Weather Conditions The majority of accidents occur in fine weather. While adverse weather increases risk per exposure event, total volume remains highest in normal conditions due to greater traffic exposure.

Light & Road Surface Conditions Most accidents occur in daylight, but severity rises in darkness with no lighting. Wet or damp surfaces show increased serious proportions compared to dry roads.

Driver & Vehicle Risk Segmentation

Vehicle Type Motorcycles exhibit the highest proportion of serious and fatal accidents, followed by heavy goods vehicles. This reflects greater rider exposure and reduced structural protection.

Driver Sex Male drivers show a slightly higher proportion of serious accidents, while female drivers have a higher share of slight accidents. Differences are moderate and likely influenced by exposure and behaviour.

Driver Age Risk follows a U-shaped distribution:

- Young drivers (17–25): elevated serious proportions due to risk-taking and inexperience
- Older drivers (66+): increasing serious share due to slower reaction times and physical vulnerability

Cross-Dimensional Observations

1. Severity is more strongly influenced by speed limit and vehicle type than by weather.
2. Accident volume is primarily driven by traffic exposure rather than environmental hazard.
3. Urban centres dominate total accidents but not necessarily fatal proportion.
4. Vulnerable road users (motorcycles) disproportionately contribute to serious outcomes.

Limitations

- Analysis is descriptive rather than predictive.
- No exposure normalisation (e.g., accidents per million miles driven).
- Limited behavioural data (alcohol, distraction, seatbelt use).
- Low fatal percentage reduces sensitivity in severity distribution.

Future Extensions

- Per-capita or per-mile exposure modelling
- Geographic clustering analysis
- Integration with machine learning severity prediction models

Conclusion

Between 2005 and 2016, the UK achieved a substantial 38% reduction in total road accidents. However, fatal severity rates have plateaued, indicating that future safety gains will require more targeted, data-driven interventions.

Key risk factors include higher speed limits, motorcycle involvement, and elevated risk among young and older drivers. Accidents remain heavily concentrated in urban commuter corridors.

This analysis supports continued focus on:

- Speed management and road design improvements
- Urban traffic flow optimisation
- Targeted interventions for vulnerable driver groups
- Prioritised motorcycle safety measures